International Process Plants

Stock #600369

155,000 MTPY
Fatty Acid Complex

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Brief Overview

- Capacity: 155,000 metric tons/year of Raw Material to make 120,000 metric tons/year of Split Fatty Acid
- Technology: Free and Clear to Practice Worldwide
- Utilities: Electricity, Steam, Water and Fuel Gas
- Year Built: Between 1980 and 2003
- Shutdown: 2009
- Product: Fatty Acids (120,000 mtpy of Split Fatty Acid), Esters (24,000 mtpy), Glycerine (17,000 mtpy); there is also a Triacetin (15,000 mtpy) & Sorbitan (9,500 mtpy) plant
- Raw Materials: Tallow (grades 2, 4 and 6)
  Natural Oils (coconut, palm, palm kernel and soya bean)

Key Points

- Complete Fatty Acid Complex *(Complete Complex includes Triacetin Plant, Sorbitan Plant, Esters Plant, Fatty Acids Plant and Glycerin Purification)*
- The operational units process natural oils and fats to make fatty acids, glycerine and esters. Capacity is approximately 120,000 mtpy split fatty acids, 24,000 mtpy esters, 17,000 mtpy glycerine; there is also a 15,000 mtpy triacetin & 9,500 mtpy sorbitan plant.
- Most of the plant was constructed in the 1980s. The Esters plant was added in 1996 and the glycerine purification section was added in 2003.
- 27 acres of land is available with the complex; with ample space to expand existing operations or to add new facilities.
- Process control systems and programming (Siemens PCS7 & Fisher-Provox) are completely up-to-date and are available for sale with the facility.
- Other assets include flaking & bagging units (3.3 mtph), tank farm consisting of (220) storage tanks with 36,000 tons of storage & 6,000 tons of total warehouse capacity.

Units included

Fatty Acid Plant 120,000 metric tons/year of Split Fatty Acid *(stock #600497)*:

- (3) Fat Splitting (Hydrolysis) Columns: 5 or 6 metric tons/hr each of fat input *(depending on product such as tallow or vegetable oil)*
- (1) Luwa Glycerine Distillation Unit: 2 metric tons/hr *(also sold separately-stock #600493)*
- (2) Fatty Acid Vacuum Distillation Units: 21 metric tons/hr total
- (1) Fat Separation Unit (wet process): 7 metric tons/hr
- (1) Fat Batch Hardening (Hydrogenation) Unit: 15 metric tons, batch cap.
- (1) Drum/IBC Filling Unit: 5.5 metric tons/hr
- (1) Flaking and Bagging Unit: 3.3 tons/hr

Triacetin Plant 15,000 metric tons/year *(stock #600496)*:

- (1) Triacetin Continuous Ester Unit: 1.8 metric tons/hr

Sorbitan Ester (Esterification) Plant *(stock #600495)*:

- (1) Sorbitan Ester Unit (highly automated and flexible batch): 9,500 metric tons/yr

Glycerine Plant 17,000 metric tons/year *(stock #600493)*:

Esters Plant 24,000 metric tons/year *(stock #600494)*:

- (1) Batch Ester Unit (vacuum to 3 bar): 20 metric tons, batch capacity
- (1) Batch Ester unit (atmospheric): 9 metric tons, batch capacity

** Units with stock #'s may be purchased individually*

Major Equipment

- (3) Splitting Columns
- Kestner 4-Stage Evaporator: *5,600 lbs/hr product (22,400 lbs/hr feed)*
- Pre-Dryer
- Condensing Column
- Stripping Column
- (2) Buss SMS Luwa Wiped Film Evaporator: *(1) 18m^2, (1) 2m^2*
- Crystallizer Banks
- WAS Mixer
- Krauss-Maffei HZ100 SO305 Centrifuge
- Krauss-Maffei HZ80 SO321 Centrifuge
- (5) Heine Centrifuges
- Dryer Vessel
- Reactor Vessel
- Filtration Tank

Splitting Columns

- This facility takes tallow from local rendering plants and converts it into fatty acids and glycerine. There are three splitting columns which are used to separate the oils and fats. The columns run at 740 psig and about 200°C. Live steam is fed into the bottom of the splitting column which drives most of the glycerine in a solution called “sweet water” (12% glycerine in water). The fatty acid stream comes off the top of the column. An additive called Zeetag is injected to assist in the separation. There are six separators following the three columns: one for each column overhead and bottom stream.

Splitting Columns (*cont.*)

- The sweet water moves to the Kestner 4-stage evaporator where the glycerine concentration is taken from 12% to 40%. In the Pre-Treatment area of the process, sulfuric acid is added to the concentrated stream to remove the last bit of fat. After separation, the stream is neutralized with lime and filter aid is added prior to going through the plate and frame filter. From there it proceeds to the glycerine distillation section of the plant. The fatty acids from the top of the splitter contain primarily oleic and stearic acids. This stream goes to the fatty acids distillation section of the plant which is outlined later in this report. There are 12 stainless steel storage tanks with a total capacity of 3,000 metric tons associated with this plant.

	Splitting Columns
Design Temp.	288°C
Design Press.	850 psig
MOC	Clad 316L
Dimensions	27m (h) 1.1m (dia.)

Glycerine Distillation Unit

- The glycerine distillation plant unit is used to refine crude glycerine from the splitting process and also from third party crude glycerine purchased from the bio-diesel industry. Crude glycerine is dried in a circulating drier and then distilled in a Luwa wiped film evaporator before being condensed and steam stripped.

	Pre Drier	Evaporator	Condensing Column	Stripping Column
Design Temp.	160°C	250°C	160°C	200°C
Design Press.	5.2 Bar	40 Bar/ -1 Bar	1 Bar/ -1 Bar	1 Bar/-1 Bar
MOC	316L	316L	316	316Ti
Dimensions	4.9m (h) 1.1m (dia.)	9.9m (l) 1.2m (dia.)	10.4m (l) 2m (dia.)	5.02m (l) 0.8m (dia.)

There are also (22) SS storage tanks with a total capacity of 1,600 metric tons associated with this plant.

Fatty Acids Distillation Unit

- Lurgi distillation units are used to refine fatty acids by removing the heavy ends and volatiles. The stream is primarily oleic and stearic acids. Distillation columns run at 5-15 millibar of vac. Stills use high pressure steam candles in the bottom of the column for heating. Spiral coolers are used as the column overhead condensers.

Fatty Acids Distillation Unit *(cont.)*

Number 3 distillation unit consists of a topper, main still and back end still:

	Pre –Still	Main Still	Back Ends Still
Design Temp.	250°C	275°C	250°C
Design Press.	30mm Hg	Full Vacuum	Full Vacuum
MOC	316Ti	316Ti	316
Dimensions	-	11.5m (l) 2.4m (dia.)	4.5m (l) 1.3m (dia.)

Number 4 distillation unit consists of a main still and back end still:

	Main Still	Back Ends Still
Design Temp.	250°C	250°C
Design Press.	Full Vacuum/2 Barg	Full Vacuum/2 Barg
MOC	-	-
Dimensions	10.4m (l) 2.75m (dia.)	4.23m (l) 1.5m (dia.)

Wet Separation Unit (*cont.*)

- The separation plant is designed to separate mixed fatty acids into saturated and unsaturated fatty acids. Fatty acid is firstly cooled though banks of crystallizers, and then mixed with a surfactant before being processed through a set of seven centrifuges. There are 12 crystallizers total which use -2°C brine for cooling. The crystallizers were manufactured in Germany and have internal mechanical scrapers to keep the walls clean. There is a 400 kw York chiller used for refrigerating the brine solution.

	Crystallizer Bank (12)	WAS Mixer	(5) Heine Centrifuges	Krauss HZ80 S0321	Krauss HZ80 S0321
Design Temp.	100°C/100°C	150°C	-	-	-
Design Press.	6/5 Bar	2.9 Barg	-	-	-
MOC	316Ti	316L	316 SS	316SS	316SS
Dimensions	8.45m (l) .368m (ID)	2.9m (t/t) 1.2m (dia.)	-	0.8m (bowl dia.)	1.0m (bowl dia.)

There are also (33) SS storage tanks with a total capacity of 3,800 metric tons associated with this plant.

Hydrogenation Unit

- The batch hardening plant uses hydrogenation to harden a range of fatty acids. The fatty acids are dried and then reacted with hydrogen using a nickel catalyst before being filtered through a plate and frame press. The hydrogenator runs at about 20 bar of pressure.

- The nickel catalyst is removed with a Schenk catalyst recovery filter and reclaimed by Johnson-Matthey. The catalyst used in this process is Johnson-Matthey Pricat™ 9932. There are 7 stainless steel storage tanks with a total capacity of 900 metric tons associated with this plant.

	Drier Vessel	Reactor Vessel	Filtration Tank
Design Temp.	200°C	350°C	110°C
Design Press.	Full Vacuum/2 Bar	35 Barg	15psi
MOC	316	316 S11	SS
Dimensions	6.3m (h) 2.5m (dia.)	5.5m (t/t) 2.4m (ID)	4.9m (h) 3.0 (dia.)

Main Esters Unit

- The ester plant is a highly automated and flexible batch plant located indoors. The plant was commissioned in 1996 and is capable of processing a wide range of ester products. Alcohols and fatty acids are initially prepared in a weigh vessel before being transferred to the reactor vessel. Reacted ester is then cooled while transferring to the bleacher vessel. The ester is further refined in the bleacher vessel before being filtered though a pressurized 5,000 liter Dr. “M” candle filter into dedicated storage tanks. The filter is used to remove the carbon which was added for color control.

	Pre-Weigh Vessel	Reactor Vessel	Bleaching Vessel
Design Temp.	-	300°C	200°C
Design Press.	-	82.8 Barg (coils) FV-7.0 Barg (shell)	FV-3 Barg (shell) FV-7 Barg (tube)
MOC	316 shell	316 shell 254 SMO coils	316 shell/tubes
Dimensions	Approx. 35m^3 (volume + agitation)	Approx. 35.8m^3 (volume + agitation)	Approx. 43.5m^3 (volume + agitation)

There are also (54) SS storage tanks with a total capacity of 2,200 metric tons associated with this plant.

Sorbitan Plant

- The Sorbitan plant is a highly automated and flexible batch plant. Sorbitol and fatty acids are prepared and heated in a pre-reactor before being transferred to the main reactor vessel. Carbon is also added to the batch to control color. Both reactors are agitated and steam heated with jackets. When the reaction is completed the batch is cooled though an external cooler before being transferred to filter tank. The batch is then filtered through two Boulton plate and frame filter presses prior to storage.

	Pre-Reactor	Reactor
Design Temp.	232°C (shell)	370°C (shell)
Design Press.	FV-3.67 Barg (shell)	FV-3.5 Barg (shell)
MOC	EN58J liner CS outer (shell) 904L (coils)	316 shell 904L (coils)

There are also (12) SS storage tanks with a total capacity of 500 metric tons associated with this plant.

Triacetin Plant

- The Triacetin plant is a highly automated and dedicated continuous plant. Glycerine is reacted with acetic acid and acetic anhydride in the bubble column and cascading reactor vessels. The overheads from the bubble column go to an azeotrope column where butyl acetate is added to help break the azeotrope so that acetic acid can be fully recovered. The crude Triacetin leaving the reactor train is then further refined in two distillation units and a deodorizer column which basically strips impurities with nitrogen.

	Bubble Column	Reactor 1	Reactor 2
Design Temp.	150°C (shell)	250°C (shell) 250°C (tubes)	250°C (shell) 250°C (tubes)
Design Press.	4.0 Barg (shell)	3.0 Barg (shell) 20.0 Barg (tubes)	2.0 Barg (shell) 20.0 Barg (tubes)
MOC	-	316 (shell) 254 SMO (tubes)	316 (shell) 904L (tubes)
Dimensions	-	$3.5m^3$	$2.7m^3$

Triacetin Plant (*cont.*)

	No. 1 Still Column	No. 1 Still Reboiler	No. 2 Still Reboiler	No. 2 Still Thermosiphon	Deodorizer
Design Temp.	200°C	200°C	200°C	200°C	200°C
Design Press.	10.0 Barg	2.0 Barg	2.0 Barg	20.0 Barg	3.0 Barg
MOC	904L	316	316	316	-
Dimensions	0.85 (dia.) x 7.5m	-	1.3m^3 working	20m^2	

There are also (18) SS storage tanks with a total capacity of 1,100 metric tons associated with this plant.

Stearine Flaking Unit

- The stearine flaking unit is used to convert molten fatty acids into to solid flake. Fatty acid is cooled and flaked on a Simons Dryers water-cooled rotary drum flaker. This unit is rated for 100 psig at 120°C and is constructed of carbon steel with a stainless steel liner. There is a 150 kw York chiller for cooling the rotary drum flaker. The flake is then conveyed with a bucket conveyor through a sieve and into automatic bag filling machines. The smaller bags (25kg) are automatically palletized and shrink wrapped. The bagging machine actually makes its own plastic bags “in situ”. The machine was constructed by Esse Gi of Italy and is a model CTX-50. The product then proceeds to a Moeller model 4420 automatic palletizer and stretch wrapping machine.

Drum Filling Unit / Tank Farm

Drum Filling Unit

- The Bilanciai D450 drum filling unit is semi automated and was installed in 2006. It is capable of filling palletized drums and IBCs.

Tank Farm

- There are about 190 storage tanks in this facility, the majority of which are constructed of SS.

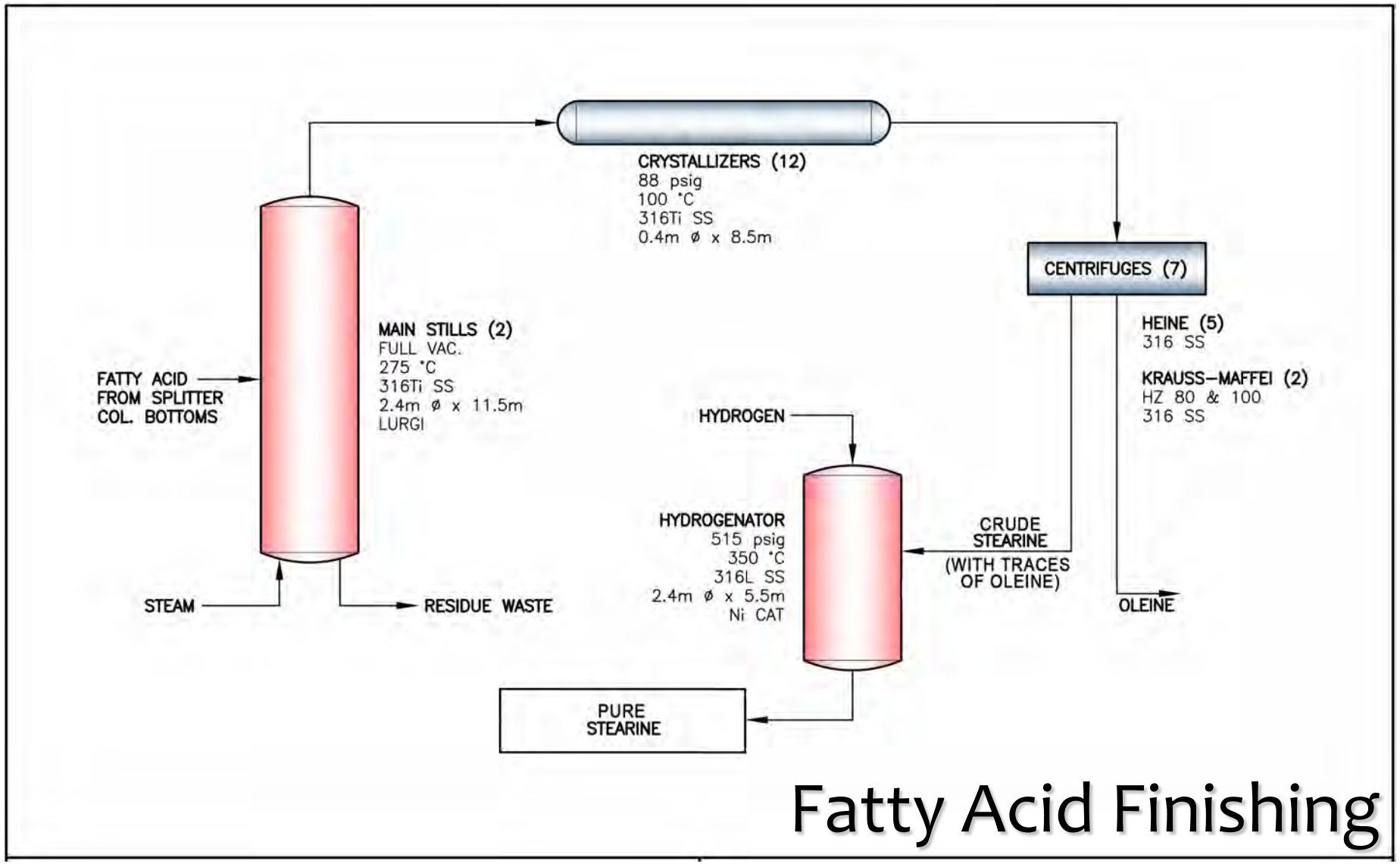
Utilities

- There are three boilers in this facility. Two are Volund units, each producing 17 mt/hr of steam at 80 bar pressure. There is a Minster unit producing 20 mt/hr at 10 bar pressure. All three boilers were installed in 1998. They are dual-fuel units capable of burning natural gas or fuel oil. *(Boilers are no longer available)*

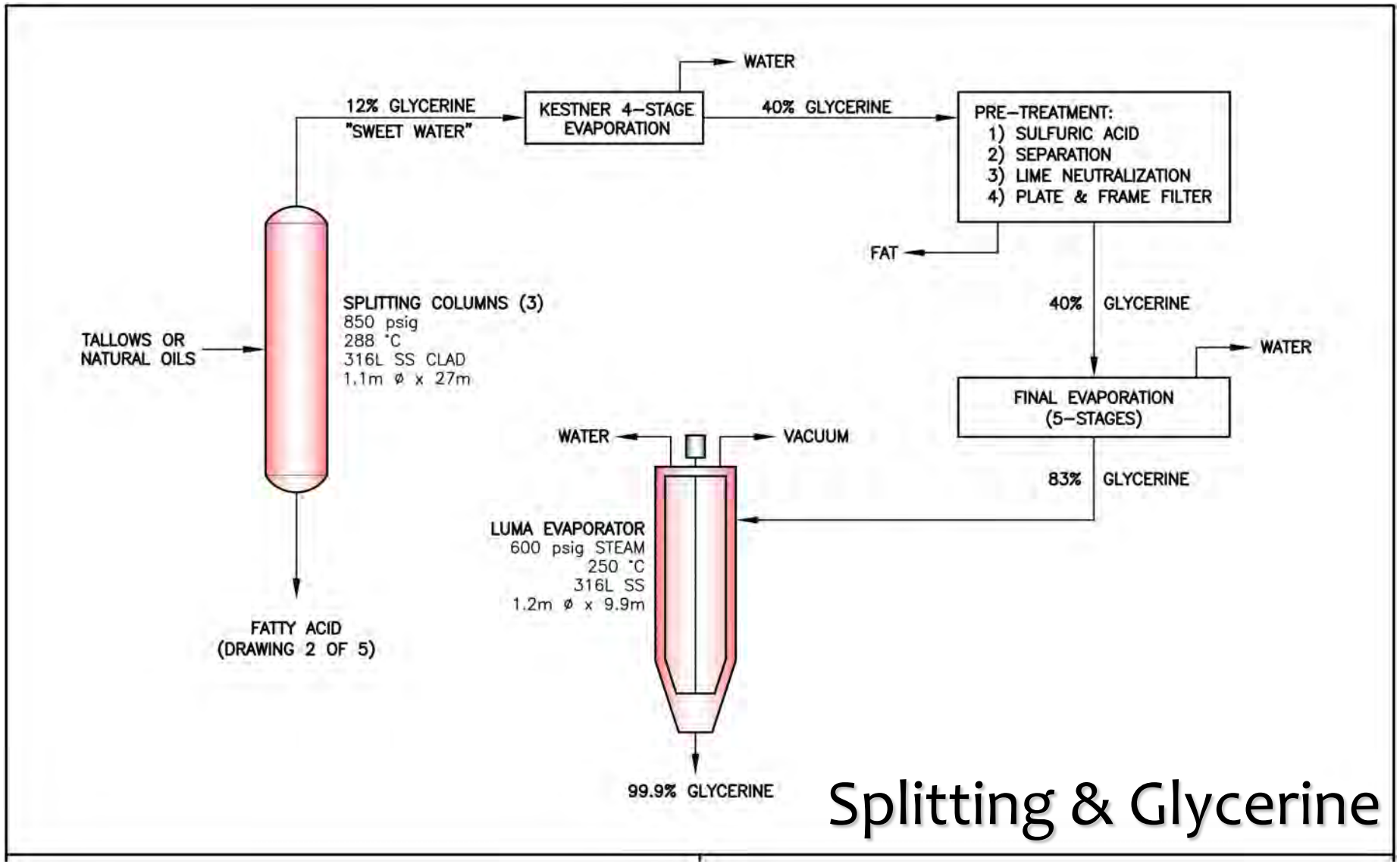
- There are two Ingersoll-Rand Centac air compressors capable of producing 900 CFM at 100 psig.

- There is no waste water treatment at this facility, but there is a sump where any residual fat is floated and skimmed off the water prior to discharge to the city sewer. They also do some slight pH adjustment of the waste water and they have two Seres 2000 COD analyzers checking the carbon content in the waste water.

Process Flow Diagrams

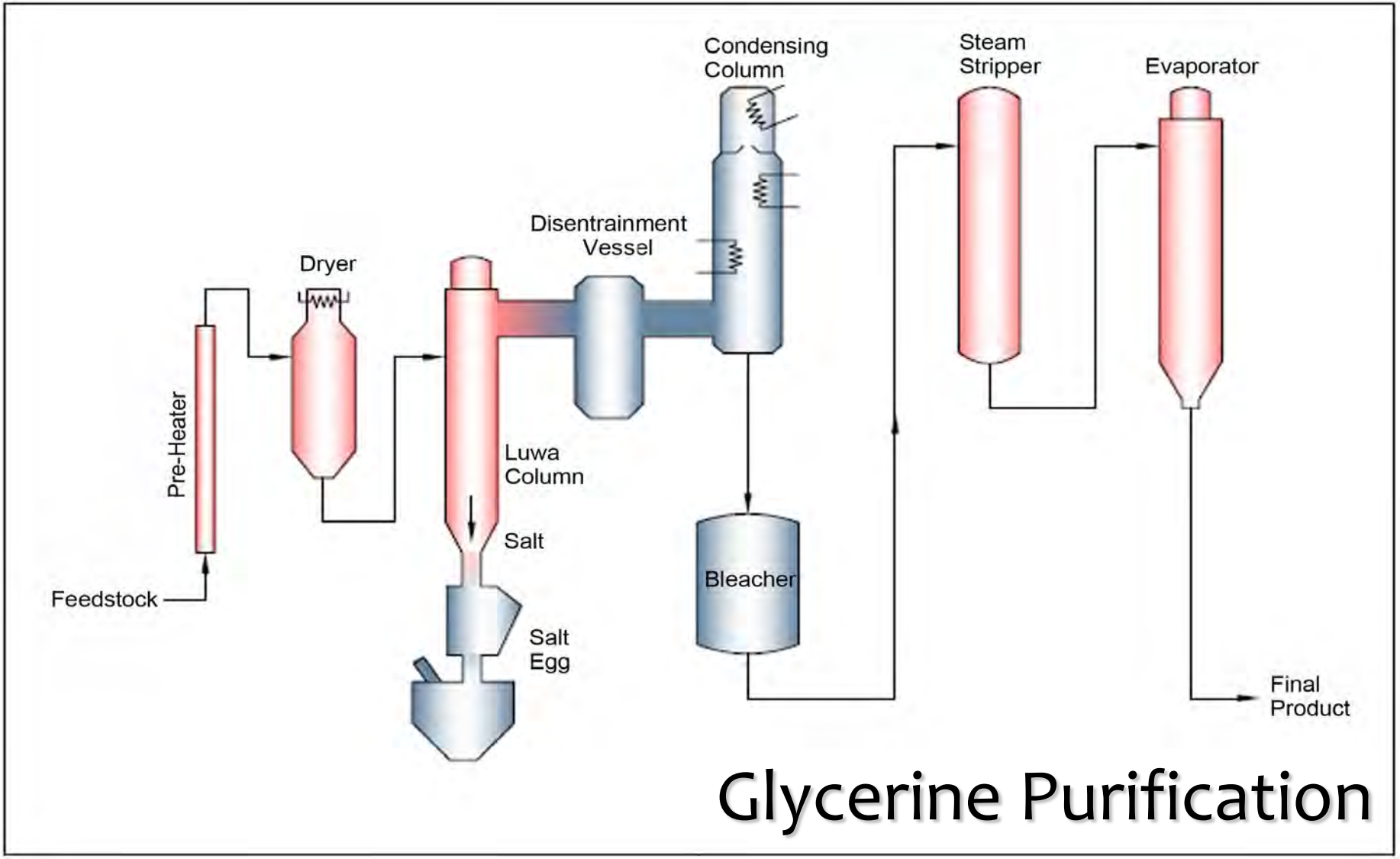


Process Flow Diagrams



Splitting & Glycerine

Process Flow Diagrams



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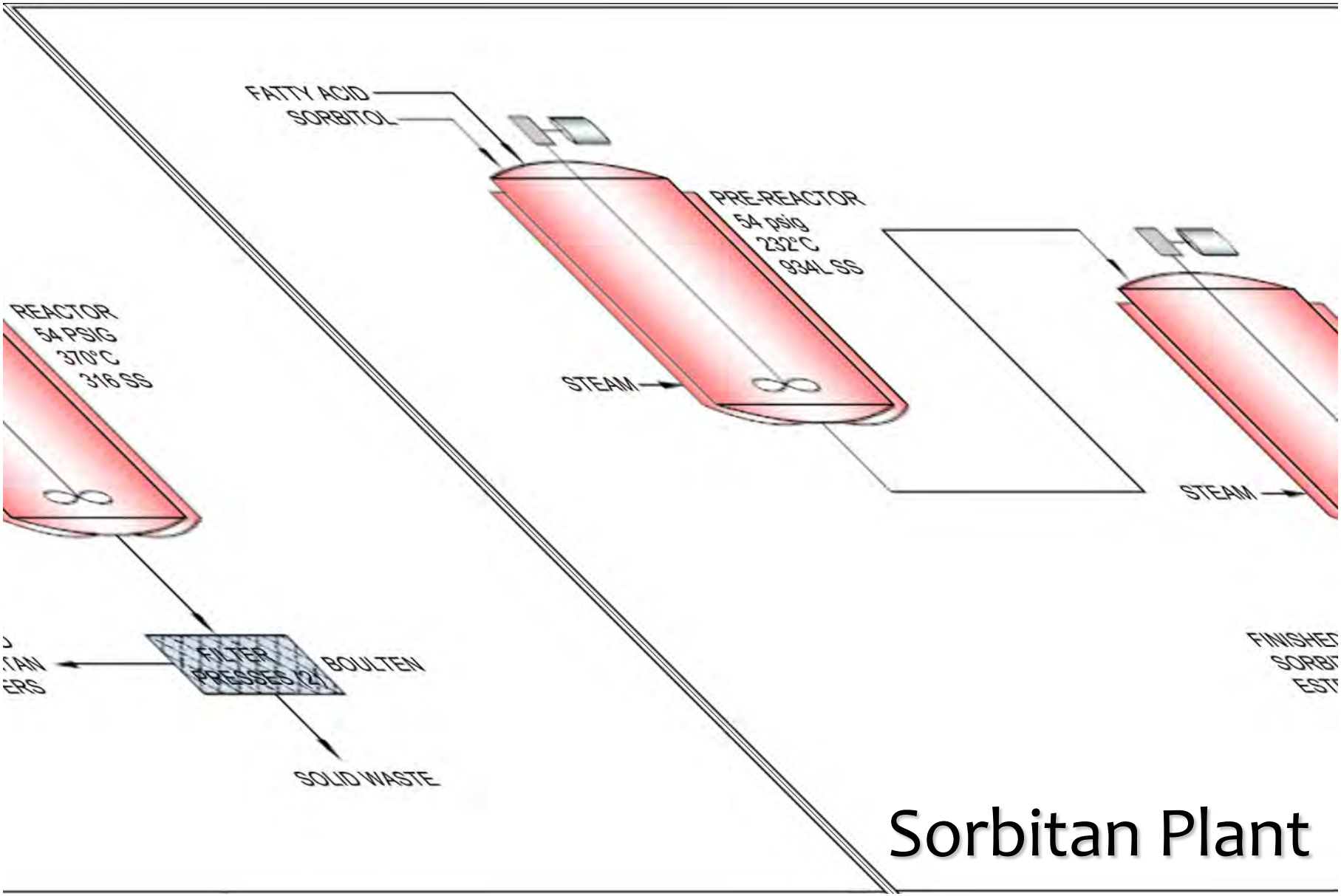

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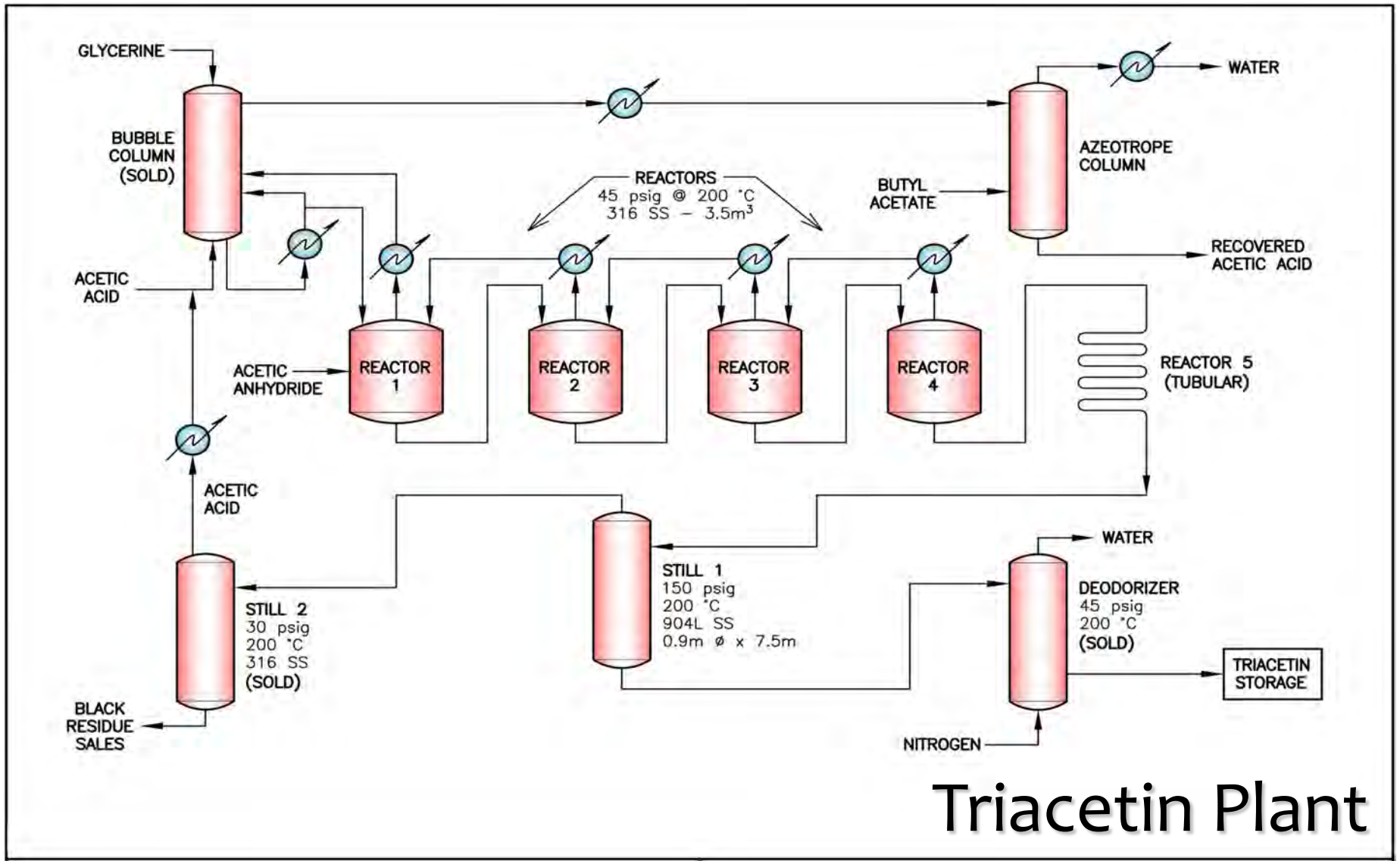

Triacetin Plant

Photos-Splitting Columns

Splitter Columns

Photos-Glycerine Purification Unit

Final Evaporator

Luwa Evaporator Structure

Photos-Wet Separation Plant

WAS Mixer

Crystallizers

Krauss-Maffei Centrifuge

Photos-Esters Plant

Main Esters Building

Dr. “M” Filter

Photos-Fatty Acids Distillation Unit

Distillation Column Steam Candles

Distillation Tank Farm

Photos-Triacetin and Sorbitan Plants

Azeotrope Column

Sorbitan & Triacetin Plants

Photos-Hydrogenation Unit

Hydrogenator (center vessel)

Hydrogenation Structure

Photos-Stearine Flaking Unit

Flaker

Simon Flaker

Photos-Utilities

Volund Boiler Burner

Volund Boiler

Air Compressor

Contact IPP Today!

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